"ripples" (as I have called them), seen in advance of a body moving uniformly through water; also a passage quoted by Russell from a paper of date, Nov. 16, 1829, by Poncelet and Lesbros,[*] where it seems this class of waves was first described.

Poncelet and Lesbros, after premising that the phenomenon is seen when the extremity of a fine rod or bar is lightly dipped in a flowing stream, give a description of the curved series of ripples (which first attracted my attention in the manner described in the preceding letter). Russell's quotation concludes with a statement from which I extract the following:— . . . . "on trouve que les rides sont imperceptibles quand la vîtesse est moyennement au dessous de 25c. per seconde."

Russell gives a diagram to illustrate this law. So far as I can see, the comparatively long waves following in rear of the moving body have not been described either by Poncelet and Lesbros or by Russell, nor are they shown in the plan contained in Russell's diagram. But the curve shown above the plan (obviously intended to represent the section of the water-surface by a vertical plane) gives these waves in the rear as well as the ripples in front, and proves that they had not escaped the attention of that very acute and careful observer. In respect to the curves of the ripple-ridges, Russell describes them as having the appearance of a group of confocal hyperbolas, which seems a more correct description than that of Poncelet and Lesbros, according to which they present the aspect of a series of parabolic curves. It is clear, however, from my dynamical theory that they cannot be accurate hyperbolas; and, as far as I am yet able to judge, Russell's diagram exhibiting them is a very good representation of their forms. Anticipating me in the geometrical determination of a limiting velocity, by observing the angle between the oblique terminal straight ridge-lines streaming out on the two sides, Russell estimates it at 8½ inches (21½ centimetres) per second.

Poncelet and Lesbros's estimate of 25 centimetres per second for the smallest velocity of solid relatively to fluid which gives ripples in front, and Russell's terminal velocity of 21½ centimetres per second, are in remarkable harmony with my theory and observation which give 23 centimetres per second as the minimum velocity of propagation of wave or ripple in water.

Russell calls the ripples in front "forced," and the oblique straight waves streaming off at the sides "free"—appellations which might seem at first sight to be in thorough accordance with the facts of observation, as, for instance, the following very important observation of his own:—

> "It is perhaps of importance to state that when, while these forced waves were being generated, I have suddenly withdrawn the disturbing point, the first wave immediately sprang back from the others (showing that it had been in a state of compression), and the ridges became parallel; and, moving on at the rate of 8½ inches per second, disappeared in about 12 seconds."

Nevertheless I maintain that the ripples of the various degrees of fineness seen in the different[†] parts of the fringe are all properly "free" waves, because it follows from dynamical theory that the motion of every portion of fluid in a wave, and, therefore, of course, the velocity of propagation, is approximately the same as if it were part of an infinite series of straight-ridged parallel waves, provided that in the actual wave the radius of curvature of the ridge is a large multiple of the wave-length, and that there are several approximately equal waves preceding it and following it.

No indication of the dynamical theory contained in my communication to the *Philosophical Magazine*, and described in the preceding letter to Mr. Froude, appears either in the quotation from Poncelet and Lesbros, or in any other part of Mr. Scott Russell's report; but I find with pleasure my observation of a minimum velocity below which a body moving through water gives no ripples, anticipated and confirmed by Poncelet and Lesbros, and my experimental determination of the velocity of the oblique straight-ridged undulations limiting the series of ripples, anticipated and confirmed by Russell. W. T.

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[*] Memoirs of the French Institute, 1829.

[†] The dynamical theory shows that the length from crest to crest depends on the corresponding component of the solid's velocity. For very fine ripples it is approximately proportional to the reciprocal of the square of this component velocity, and therefore to the square of the secant of the angle between the line of the solid's motion and the horizontal line perpendicular to the ridge of the ripple.

ALLBUTT ON THE OPHTHALMOSCOPE

On the Use of the Ophthalmoscope in Diseases of the Nervous System and of the Kidneys; also in certain other General Disorders. By Thomas Clifford Allbutt, M.A., M.D., Cantab. &c. (London and New York: Macmillan and Co., 1871.)

THE advances that have been made in the knowledge of the diseases of the eye since the introduction of the ophthalmoscope are now very widely known, not alone in the medical profession but to the general public. This little instrument, essentially consisting of a mirror with a hole in the centre by which a ray of light can be thrown into the interior of the eye, lighting up its recesses, and enabling, with the aid of a common hand lens, almost every portion of it to be explored, may be said to have revolutionised the surgery of the eye. Many separate and distinct types of disease have been distinguished in conditions that were formerly grouped together under the general term of amaurosis, and the ophthalmic surgeon, no longer administering, as was too often formerly the case, his remedies in rash ignorance, is now able either to infuse well-grounded hope of recovery, or to spare his patient the annoyance of protracted treatment when treatment would be hopeless. For nearly twenty years the use of the ophthalmoscope has been, as was natural, almost entirely restricted to those who devoted themselves to the study of ophthalmic diseases. Like other mechanical aids to diagnosis, as the stethoscope and laryngoscope, its employment requires practice, the opportunities for acquiring a mastery over it were till recently rare, and its value in the practice of medicine was by no means generally recognised. Within the last few years, however, several excellent surgeons and physicians, amongst whom Mr. Hutchinson, Dr. Hughlings Jackson, Dr. John Ogle, and the author of the treatise before us may be especially mentioned, have gradually begun to recognise that the ophthalmoscope may be made available not only to determine the nature of any defect of vision of which the patient may complain, but as a means of reading within certain limits changes in the conditions of the system at large, and of the nervous system in particular.

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The work of Dr. Allbutt is, however, the first treatise in English that is occupied exclusively with the ophthalmoscopic appearances presented in cases of cerebral disease, or in other words with the diagnosis of nervous affections by the ophthalmoscope. Abroad he has been preceded by M. Bouchut, whilst the volumes of the "Archiv für Ophthalmologie" are a mine of original memoirs written by the best ophthalmologists in Germany on the bearings of ophthalmoscopic observations on nervous affections. To these, of course, Dr. Allbutt makes frequent reference. In no instance, however, have we noticed a servile adherence to the opinions of others, the statements he quotes being always checked by his own observations, and every page bearing the stamp of very careful and sound investigation. It is impossible with the limited space here at disposal, and it would perhaps scarcely be interesting to many of our readers, to give what the work really deserves, a *résumé* and discussion of its successive chapters; but we may here perhaps point out one or two of the principal points of interest.

In speaking of the disc of the optic nerve, Dr. Allbutt expresses himself in favour of the view of Galezowski, who is fortified by the observations of Leber, to the effect that the vascularity of the disc is to a great extent independent of that of the retina, and rather forms a part of the vascular system of the brain. The importance of this principle in enabling deductions to be drawn respecting the occurrence of intercranial disease is obvious. Proceeding on this hypothesis, Dr. Allbutt points out the changes that are visible in a large number of different affections. He draws a strong line of distinction between ischæmia and optic neuritis, conditions that have hitherto been almost invariably confounded by ophthalmic surgeons, but of which the former is produced by some cause, often of a mechanical nature, interfering with the return of the blood from the retina, whilst the latter is a true inflammation of the nerve. The diagnosis of the two in their earlier stages is very clearly and correctly laid down. At a later period both conditions pass into white atrophy, and it is not always then easy to pronounce which of the two has previously been present. His views, in regard to changes in the optic disc from intercranial disease, are clearly laid down in the following passage (pp. 129, 130):—"We find optic changes in connection with two kinds of intracranial disease in particular; the one tumour, the other meningitis. When we analyse the matter one degree further, we ascertain that, although the choked disc (ischæmia) and the inflamed nerve may co-exist with either of these kinds of disease, that nevertheless the choked disc is far more commonly found in association with tumour and hydrocephalus than the inflamed nerve. The inflamed nerve, on the other hand, is very commonly found in association with meningitis, and of meningitis not of the surface, nor of parts near any supposed vasomotor centres, but with meningitis near the centre." And with this we are disposed substantially to agree. Dr. Allbutt expresses himself in very doubtful terms in regard to the existence of tobacco amaurosis, and it certainly is extraordinary that, if really constituting an effect of the use of that leaf, it is not of more frequent occurrence amongst the Germans and Americans, who are much larger consumers than either the French or ourselves.

Our readers will see that Dr. Allbutt has, if not exactly opened up, at all events vigorously worked at, a new field of medical investigation. This field promises when duly cultivated to yield very valuable fruit; and, we are sure, the conclusion at which every candid reader will arrive, after carefully perusing it, will be that no physician should consider he has fully examined any case of cerebral disease unless he has accurately investigated the appearances presented by the eye under the ophthalmoscope. It is not to be supposed that Dr. Allbutt has by any means exhausted the subject. Many difficulties lie in the path of the most diligent inquirer. In many instances conditions of disease are seen to be present, as to the nature of which only a guess can be formed, and respecting which from forgetfulness or lack of observation on the part of the patient no history can be obtained; whilst in a multitude of cases the disease is seen only at one stage of its progress, and the physician is unable to ascertain, owing to his losing sight of his patient, the ulterior changes that take place.

Lastly, in many cases the prejudice of friends (a point to be greatly regretted) prevents the examination of the eyes after death. The fragmentary character of many of the reports of cases collected by Dr. Allbutt in his appendix is painfully evident, and leaves many hiatuses to be filled up by future research. We may, however, in conclusion, thank Dr. Allbutt for having published a work which constitutes an important step in the advancement of medicine, and will certainly form a very valuable guide to the profession at large, nor may we omit to thank the publishers for the excellent manner in which the book has been issued from the press. H. POWER

OUR BOOK SHELF

Hardy Flowers: Descriptions of upwards of thirteen hundred of the most ornamental species, and directions for their arrangement, culture, &c. By W. Robinson, F.L.S. (London: F. Warne and Co., 1871.)

MR. ROBINSON is a prolific writer, but his prolificacy (as Webster has it, if Dr. Ingleby and Dr. Latham will allow us the word) does not degenerate into mere book-making. Like its predecessors, this volume is one of practical utility both to the professional gardener and to the cultivator of flowers for their beauty. Much the greater part of the volume is occupied with a descriptive list of the most ornamental hardy flowers, with directions for their culture, suitable positions, &c.; but this is introduced by some practical hints on the general subject of gardening. That Mr. Robinson has the courage to attack some time-honoured gardening customs, will be seen from the following paragraph:—"No practice is more general, or more in accordance with ancient custom, than that of digging shrubbery borders, and there is none in the whole course of gardening more profitless or worse. When winter is once come, almost every gardener, although animated with the best intentions, simply prepares to make war upon the roots of everything in his shrubbery border. The generally accepted practice is to trim, and often to mutilate, the shrubs, and to dig all over the surface that must be full of feeding roots. Delicate half-rooted shrubs are often disturbed; herbaceous plants, if at all delicate and not easily recognised, are destroyed; bulbs are often displaced and injured; and a sparse depopulated aspect is given to the margins, while the only 'improvement' that is effected by the process is the annual darkening of the surface of the upturned earth." After

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